BEFORE
THE PUBLIC SERVICE COMMISSION
OF SOUTH CAROLINA

DOCKET NO. 2020-63-E

IN RE:	Bridgestone Americas Tire Operations, LLC, Petitioner, v. Dominion Energy South Carolina, Inc. Respondent.	**DIRECT TESTIMONY OF EDWARD G. McGAVRAN III, PE**

Q. PLEASE STATE YOUR NAME, POSITION, AND BUSINESS ADDRESS FOR THE RECORD.

A. My name is Edward G. (Ted) McGavran III, P.E., 220 Cape August Place, Belmont, North Carolina 28012.

Q. ON WHOSE BEHALF ARE YOU PRESENTING TESTIMONY IN THIS PROCEEDING?

A. I am testifying on behalf of Bridgestone Americas Tire Operations, LLC ("BATO").

Q. WERE YOUR TESTIMONY AND APPENDIX PREPARED BY YOU OR UNDER YOUR DIRECT SUPERVISION AND CONTROL?

A. Yes, they were.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND RELEVANT EMPLOYMENT EXPERIENCE.

A. I have a Bachelor of Science in Electrical Engineering from North Carolina State University. I worked for North Carolina Electric Membership Corporation while at NC State as a Power Supply Technician doing analysis of substation and transmission line cost estimates and long-range planning, deploying a statewide load management system and working on issues related to the Catawba Nuclear Project Agreement. Upon graduation I joined Electrical Consulting Engineers in Charlotte, NC and worked as a project engineer until 1991. My duties there included transmission and substation design projects, system planning and feasibility studies, and Environmental Reports, all for electric coops in the southeast. In 1991 I started McGavran Engineering and continued to do the same types of projects but expanded into other areas including telecom and fiber optic system designs, pole attachment and rate contracts and disputes, siting and routing of transmission lines and substations, system protection studies, and other engineering items for electric coops, municipal systems, and industrial and military clients. I got into

the renewable energy field in 2010 and have done interconnection and system designs, cost estimates, feasibility studies and project development, mostly with solar projects throughout the US but have worked on large wind projects as well as the Engineer of Record for projects ranging from small rooftop to large utility scale projects in excess of 100 MW. I sold the business in 2016. I have been an independent consultant since then. Additional details regarding my education and work experience are set out in Appendix A of this testimony

I. PURPOSE OF TESTIMONY

Q. PLEASE DESCRIBE THE SCOPE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony in this proceeding is to describe the solar array's connection to and operation with the BATO Passenger and Light Truck Tire Plant and to present my findings and recommendations to the Commission.

Q. PLEASE PROVIDE THE COMMISSION AN OVERVIEW OF BATO'S SYSTEM.

A. BATO'S Passenger and Light Truck Tire Plant ("Plant") is served by DESC via a 115 kV transmission line and 115 – 13.8 kV substation to serve the Plant. The Plant is metered on the low side of the power transformer(s) at 13.8 kV. In 2009, the contract demand was 15,000 kW with a maximum capacity of 37,000 KVA. The contract was amended with the power company for a plant expansion of 7,428 kW in January 2012. Contract demand was changed to 18,520 KW. The power transformers and the substation are owned by the utility.

Q. PLEASE DESCRIBE THE PLANT'S ELECTRICAL OPERATIONS.

A. BATO'S Plant is a very heavy industrial load which includes large motor loads such as major air compressors and chillers that exceed 1000 kVA. These large components are necessary for the production process.

The Plant is capable of running with one transformer in service and switching out the main breakers for maintenance and/or a fault that would isolate one side of the system. So, if one transformer is out of service the other can carry the entire load. This is a typical major industrial design which offers redundancy through a multiple point of failure operating philosophy. That is why the contract demand is for 18,520kW but actual system capacity is 37,000 kVA.

Load on the Plant varies depending on production schedules. It is the case as with most large industrial there is an overall Plant shutdown the week of July 4 and the Christmas-New Year's holidays. That is done primarily for Plant maintenance that includes the Plant electrical system. At that time, the Plant load is at its lowest.

Q. PLEASE DESCRIBE BATO'S EFFORTS TO PROVIDE ELECTICITY TO ITS PLANT USING RENEWABLE ENERGY.

A. In the last few years BATO has looked to expand its footprint in renewable energy. The company contracted with Solar Alliance to produce a solar generation resource on the BATO site. BATO ultimately determined to design and construct a 2.38 MWdc array on the site that has as an effective output of

1.98 MWac. The system does not interconnect with the utility and it is internal to the Plant only.

At 1.98 MWac delivered at max operating capacity of the resource, the solar array will deliver no power to DESC's grid. The net effect of the resource will be to displace some load from the utility and is in the nature of a negative load.

Q. PLEASE DESCRIBE BATO'S INITIAL EFFORTS AT EXPANDING ITS FOOTPRINT IN RENEWABLE ENERGY.

A. BATO's first attempt to construct a solar array at the Passenger and Light Truck Tire Plant was not successful. The Plant was chosen as a pilot project for installation on a Plant footprint due in part to the fact that at the time SCE&G's fast track interconnection process offered an attractive power purchase agreement ("PPA") and interconnection process that would enable an aggressive schedule for an in-service date that would produce an attractive rate of return for the project. SCE&G's program was for projects of 2.0 MW and under and offered the promise of a relatively short application process with a 14 cent per kWh power purchase agreement.

With the fast track option viewed as the most attractive option for interconnection to the utility system, BATO contracted with Solar Alliance to build a project on the Plant footprint. SCE&G was notified of the project prior to April 2017. The original plan was to interconnect with SCE&G's distribution system in the area adjacent to the Plant. It must be noted here that it was never possible to interconnect with the actual Plant utility service which comes in at 115 kV and is transformed to 13.8 kV. That is because it would be very expensive and operationally difficult to interconnect at the Plant substation. That option was not considered.

BATO decided to propose an interconnection with an 864 KW capacity project on utility circuit 13062 with a capacity of which is fed from the Sage Mill Industrial Park

Substation. That application was submitted into the Fast Track process and a report was issued by SCE&G dated June 2, 2017. The results of that study were that the project was failed even though it met all screens for Fast Track approval. The "fail" conclusion was based on the additional 1.5 MW of generation already in the queue on this substation. As such, additional study was required beyond the fast track process. Under the fast track program, the solar generator would directly interconnect to the utility.

Q. AFTER BEING TURNDED DOWN FOR THE FAST TRACK PROGRAM, DID BATO RECONSIDER ITS SOLAR OPTIONS?

A. Yes. BATO rethought its strategy. Because interconnection with SCE&G was not feasible, BATO decided that a direct connection between the solar array and the Plant distribution system would be a better alternative to in interconnection with the utility. Solar Alliance and McKim & Creed designed a new project which was 2.34 MWdc in size that would produce 1.98 MWac power to the Plant. Permits and design were completed in December 2017 and substantial completion was achieved by the July 4, 2018 Plant shutdown.

Q. PLEASE DESCRIBE THE MANNER IN WHICH THE SOLAR ARRAY IS CONNECTED TO THE PLANT AND IS INTENDED TO BE OPERATED.

A. The solar array is connected directly to the Plant on Feeder #2 – 7A with a standby feed from #1 -7A. The numbers 1 and 2 indicate which main breaker these circuits are fed from. The normal feed is from Main Breaker # 2. In this case what we have is a normally operating feed from the 1200 A circuit breaker #7 off the #2 Main Bus. The #2

Main Bus is rated at 2000 Amps and is protected by the #2 main breaker which is a 2000 Amp breaker. For redundancy, the #2 main bus has an additional 2000 Amp Tie Breaker to connect it with Main Bus 1 in the event the utility source for Main Bus 2 is out of service. This is true for Main Bus 1. The tie breaker is normally open. The alternate feed from main Bus 1 operates identical to the normal feed in that it is protected primarily by the 1200 breaker on feeder 7 from main bus 1 and that bus is protected by the 2000 amp main bus 1 breaker. The result of this connection is that the solar array is in no way interconnected to the utility grid and is in fact two levels of protection removed from it not counting the fused protection on the solar array itself as revealed in the design drawings.

Operationally from the utility perspective the solar array acts as a negative load. It is not connected in parallel with the utility and is in fact a series connection with the Plant. It functions as a behind the meter resource which displaces load from the utility. Attached ais Exhibit 1is a diagram demonstrating the manner in which the solar array is connected to the Plant and is intended to be operated.

Q. DESC SUGGESTS THAT THE SOLAR ARRAY WILL BACK FEED ONTO ITS SYSTEM. DO YOU AGREE?

A. No. The power reverse flow relays and the limited capacity of the solar array ensure that the solar array will not back feed onto DESC's system.

The solar array does not operate in parallel with or interconnected to DESC's system. As such, all Public Service Commission requirements and utility requirements that would apply to parallel operation of a solar or distributed generation resource do not apply to

this situation. The solar resource operates behind the utility meter as opposed to being a net meter facility, and its effect is to displace load from the utility system during its times of operation.

Q. PLEASE DESCRIBE THE ECONOMIC IMPACT OF BATO'S SOLAR ARRAY ON DESC.

A. To fully understand the comments above, a deeper analysis of the BATO facility, solar array, and utility system is required. Since we are determining the actual impact of the solar array on both the Plant and utility system, it is important to have a good understanding of how they all work together.

As previously mentioned, the BATO Plant is a large industrial facility that uses between 214 MWH – 252.3 MWH based on data from 2014 – 2019. The facility has paid the utility annually for that time period between [redacted] for electricity. The average cost of power in 2019 was [redacted]/KWH. If we assume a 20% capacity factor for the solar array, we would expect a maximum energy production on an annual basis to be 3,486,480 KWH (3.486 MWH). This solar array total year energy output would have been 1.4% of the entire facility load for 2019. The economic impact of that generation to the utility is a behind the meter scenario. If we used any other year (say 2017), the same energy production would have occurred, and the percent of total energy would be about the same percentage of overall used of approximately 1.4%. If we use a blended average cost of power rate for 2017, the cost impact on the utility would have been a loss of annual revenue of approximately $244,000 displaced by the solar resource. In a greater scheme, this represents a very small amount of both energy and money to the utility. However, as

can be seen from the testimony of BATO witness Courtney Cannon, it is the case that the economic effect here is positive to BATO .

Q. DOES THE OPERATION OF THE SOLAR ARRAY HAVE AN IMPACT ON DESC'S EQUIPMENT AND FACILITIES?

A. As stated above, the Plant's electrical system is a complex industrial power system that features redundancy on both the facility side and the utility side. The facility is fed from the utility via two main breakers to two separate 2000 Amp buses owned by BATO each protected by two BATO owned 2000 Amp 15 kV class circuit breakers with Multilin relays to sense faults on the system. Each bus provides service to 13.8 kV distribution feeders that provide power to the various feeders that are protected by 1200 amp circuit breakers utilizing Multilin relays for fault detection. Bus 1 has 10 feeders and associated breakers; bus 2 has 12 feeders and associated breakers. The buses operate separately but there is a 2000 amp tie breaker that is normally open which in the event one of the two utility feeds is off, either main breaker the tie breaker can be closed and the facility can operate off one of the main buses.

The load on the facility is steady except for the July and December shutdowns. The trend line for the year 2017 which was the test year for the solar project indicated a peak demand over 20 MW and always in excess of 10 MW except for the Plant maintenance shutdowns in July and December. Those load readings are above 5.0 MW each and are actually closer to 7 MW, both well in excess of the solar max output of 1.98 MW.

During my visit to the Plant on May 15, 2020, which was not operational due to the Covid 19 pandemic, I recorded off the Plant metering in the powerhouse that bus 1 was drawing

4.2 MW and 2.5 MVAR for a total of 4.9 MVA. Bus 2 was drawing 5.7 MW and 3.1 MVAR and 6.5 MVA. As this was an absolute minimal operating condition it is my opinion that there would never be any back feed from the generating resource to the utility at any time.

The Mutilin 350 electronic relays on both main breakers are multifunction relays each with reverse power relaying capability (device number 32). This is a standard feature for large industrial systems.

The solar array can utilize the reverse power function to eliminate the possibility of back feed of power back on to the utility system. DESC would determine the standards and settings of the Mutilin 350 electronic relays in conjunction with the Plant to ensure against back feed. Once those standards and settings are implemented on both main breakers, there is no possibility of any back feed from the solar array to the utility at any time.

The Plant has multiple layers of protection and isolation for the solar array from the utility grid. The Plant is served from a feeder from main bus 2 as mentioned above with an alternate feed from main bus 1. The 1200-amp feeder breakers that protect those feeders serve to protect and isolate the solar array from the main bus, the main bus breaker and the tie breaker. Additionally, at the point of connection to the Plant, the solar array has a 125-amp type “E” fuse and a disconnect switch, which means that from the solar array back to the utility system, there are three protective devices in series that protect and isolate the solar array from the utility grid.

The solar array does not interconnect directly with the utility grid. Nor does it operate as a parallel “net meter” facility. The solar array operates inside the Plant as a separate power

generating resource and acts in effect as a negative load that has the effect of displacing energy from the utility as noted above. With the implementation of the reverse power relaying function, the solar array has no chance of ever having any impact on the utility grid. Consequently, no utility interconnection agreement is required for safe system operation in of this facility.

Q. HAS BATO MET ITS OBLIGATIONS UNDER ITS CONTRACT WITH DESC?

A. Yes. BATO has complied with its contract for electric service with DESC. BATO's solar array meets every condition imposed upon it by the utility. Since the solar array does not interconnect with the utility in anyway and does not operate in a parallel manner it is not subject to the interconnection process. There is no need for the utility to do any type of study on that system to determine system impacts or additional facilities. It is also the case that BATO is not asking for a PPA which requires an interconnection with the utility.

II. <u>RECOMMENDATIONS AND CONCLUSION</u>

Q. PLEASE SUMMARIZE THE RESULTS OF YOUR ANALYSIS IN THIS CASE.

A. The following considerations and conclusions are reached as a result of my field investigation and analysis of the data and information provided to me regarding the solar array, the BATO facility and the SCE&G (DESC) information as follows:

*The solar array does not operate in parallel with the utility. That is obvious from the fact that it connects directly with the Plant on an existing internal feeder and is far removed electrically from the utility system. All load from the solar array is delivered to the facility directly.

*SCE&G agreed that there is no utility interconnection and that the solar array is connected to the BATO facility, not the utility as is obvious. SCE&G advised so much in April 2018 when they reviewed the system design and agreed the solar array connected with the Plant and that no impact study would be required.

*Due to the nature of the Plant operation which never dips under 6.0 MW under normal conditions, the solar array has no impact on the utility grid since no power is exported to the grid.

*In abnormal times such as the present pandemic load on the Plant does not dip to the level to allow the solar array to backfeed onto DESC's grid.

*BATO has complied with its power contract of notifying the utility of any changes or upgrades on its system with regard to the solar facility. The utility was notified of the project prior to April 2017.

*Implementation of reverse power relaying eliminates completely the possibility of any impact on the utility system. DESC should provide guidance on what the relay set points should be. BATO should implement those settings and verify with the utility they are in service and have a witness test run with the utility present to verify the settings.

*The net effect on the utility system by the solar array

will be that it will act as a negative load while in operation and will displace 1.4% of the total annual system energy and associated sales of that energy to BATO. Other than that,

the utility will see no system impact. It is likely the case that the existing motor loads in the Plant will have far more impact on the utility system grid than the solar array.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.